What is claimed is:

1. A method for the self-calibration of a tunable, diode pumped solid state laser in which the frequency or the wavelength of the laser radiation of the fundamental frequency and/or doubled frequency is changed comprising the step of:

changing the optical cavity length by a piezo-actuator or Brewster window over the total amplification bandwidth of the laser-active material; and

further including the steps of:

recording and storing the performance curves during the tuning of an etalon or corresponding optical elements arranged in the cavity;

generating or deriving a tuning function for the respective optical element or optical elements from these curves by a microcontroller or computer; and

adjusting an optimum working point for the optical element or optical elements for maximum suppression of side modes by a digital or analog regulator with the help of a learning curve or learning characteristic.

2. The method according to claim 1, wherein the etalon or an optical element is tuned with increasing amplitude for recording the learning curve and there is a correction of the deviation from the optimal position at the edge of the tuning range of another optical element.

3. The method according to claim 1, wherein the adjustment of the etalon is adapted to the change in length of the cavity.

4. The method according to claim 1, wherein for optimizing an optical element, the optical element is itself modulated or another optical element is modulated.

5. The method according to claim 1, wherein by modulating the optical element, a tuning characteristic of the latter or of another optical element is generated (recorded) and stored.

6. The method according to claim 1, wherein the frequency-selective elements of the laser are adjusted between two mode jumps by the microcontroller or computer according to the recorded laser characteristic in such a way that side modes are suppressed to a maximum degree.

7. The method according to claim 1, wherein the performance curve of the laser is recorded with a change of the rotational angle δ of the etalon and constant cavity length and with a change in the cavity length and a stationary etalon.

8. The method according to claim 1, wherein the learning characteristic is adjusted in that the cavity length (the "finest" frequency-selective element of the laser) determining the frequency is tuned with increasing amplitude, in that the mode jumps occurring at the edge of the tuning range are detected and/or registered by a suitable measuring instrument or via the output of the laser, wherein the movement of the next coarsest frequency-selective element at the edge of the tuning range is then changed until a frequency jump (in the characteristic) no longer occurs, and wherein the entire position (movement) of the coarser element is then stored.

9. An arrangement for the self-calibration of a tunable, diode pumped solid state laser, wherein the laser comprises:

a laser diode as pump light source followed by in-coupling optics, a laser crystal followed by out-coupling optics or a nonlinear, frequency-doubling crystal, wherein the outer surfaces of the laser crystal and frequency-doubling crystal or out-coupling mirror have a reflective coating for the laser fundamental frequency and/or for the frequency-doubled radiation and enclose the cavity between them; and

further comprises:

an actuator for varying the cavity length for purposes of tuning the laser;

an etalon being provided inside the cavity for changing (expanding) the tuning range and for determining the output power of the laser, wherein the etalon is rotatable or swivelable about an axis of rotation which extends at right angles to the optical axis of the laser or at an inclination to the latter by a small angle.

10. A diode pumped solid state laser according to claim 9, wherein the etalon is constructed as a transparent disk which is rotatable or swivelable about the axis of rotation and is angularly adjustable by an angular drive.

11. The diode pumped solid state laser according to claim 10, wherein a stepper motor, known per se, at least one of whose coils is controllable by means of a controlling circuit, is provided as a drive device.

12. The diode pumped solid state laser according to claim 10, wherein a piezo-actuator in operative connection with the etalon directly or with the intermediary of additional elements is provided as drive device.

13. The diode pumped solid state laser according to claim 10, wherein the piezo-actuator comprises a bending element as driving element.

14. The diode pumped solid state laser according to claim 10, wherein only one coil of the stepper motor is controlled.

15. The diode pumped solid state laser according to claim 10, wherein both coils of the stepper motor are controlled, wherein the field vector is modulated to prevent hystereses.

16. The diode pumped solid state laser according to claim 10, wherein the motor is operated in microstep operation.

17. The diode pumped solid state laser according to claim 10, wherein the rotational axis of the etalon is arranged so as to be inclined at an angle δ of less than 10° in relation to the vertical line to the optical axis of the laser.

18. The diode pumped solid state laser according to claim 10, wherein a flexible element with good heat conductivity is provided for cooling the moving element.

19. The diode pumped solid state laser according to claim 10, wherein the element with good heat conductivity is made of copper.

20. The diode pumped solid state laser according to claim 10, wherein wedge-shaped crystals or other wedge-shaped optical elements are provided for preventing formation of parasitic etalons.

21. The diode pumped solid state laser according to claim 10, wherein a standing wave cavity is provided in such a way that a more secure single-frequency operation is achieved by means of suitable matching of the selectivity of the etalon with the suppression of side modes by spatial hole burning achieved by the arrangement and selection of thickness and doping of the laser crystal.

22. The diode pumped solid state laser according to claim 10, wherein the cavity length is less than 5 mm.

23. The diode pumped solid state laser according to claim 10, wherein a piezo-actuator with a stationary etalon is provided for tuning the laser, wherein the frequency step range FSB of the etalon is greater than the amplification

bandwidth of the laser crystal and the fineness is selected in such a way that a secure single-frequency operation is ensured in the maximum tuning range.

24. The diode pumped solid state laser according to claim 10, wherein the etalon is moved jointly in order to achieve a larger tuning range.

25. The diode pumped solid state laser according to claim 10, wherein both coils of the stepper motor are controlled, wherein the position of the etalon is modulated.